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ARMY "NEW STANDARDS" PERSONNEL: EFFECT OF REMEDIAL LITERACY TRAINING ON PERFORMANCE IN MILITARY SERVICE

By

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Human Resources Research Organization
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MANPOWER DEVELOPMENT DIVISION
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AIR FORCE SYSTEMS COMMAND

BROOKS AIR FORCE BASE, TEXAS

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FOREWORD

This research was performed by the Human Resources Research Organization (HumRRO), Alexandria, Virginia, under Army Contract Number DAHC 19-70-C-0012, HumRRO Task Order 70-10, MIPR Number FX 2840-0-4170, Research Concerning Factors Relating to the Active Service and Reserve Service Performance of Project 100,000 Men and Other Military Separatees. Mrs. Jeanne Fites, Air Force Human Resources Laboratory (Manpower Development), Air Force Systems Command, served as Contract Monitor.

The research was conducted by HumRRO Division No. 7 (Social Science), Dr. Arthur J. Hoehn, Director. Dr. Hoehn served as Principal Investigator; the Work Unit Leader was Dr. Allan H. Fisher, Jr. Most of the statistical work was carried out by Mr. Gary J. Hartzler. Dr. George H. Brown of Division No. 7 participated in the writing of the report.

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The research was conducted during the period of March 1970 to April 1971. The manuscript was released by the author in April 1971, for publication as an AFHRL(MD) Technical Report. No copyrighted material is contained in the report.

This technical report has been reviewed and is approved.

George K. Patterson, Colonel, USAF
Commander

ABSTRACT

In 1966 the Department of Defense lowered entrance standards for military service. Many of the "New Standards" men who then entered the service were placed in remedial training programs (Army Preparatory Training, APT), designed to upgrade their literacy status to a fifth-grade level or higher. This research sought to determine whether "success" in remedial literacy training was associated with superior military performance. Another objective was to develop an equation for predicting terminal literacy scores. Analysis for 9,000 Army personnel was carried out on data extracted from the computerized Project 100,000 data file. Men who were successful and unsuccessful, respectively, in literacy training did not differ greatly in most performance indices. Successful trainees were slightly more likely to achieve higher pay grades and to be judged eligible for reenlistment. A multiple regression equation was developed for predicting success in the literacy training course. This analysis, using a randomly selected half of the group, yielded a multiple correlation of +.52; cross-validation with the remaining half of the group produced a correlation of +.50.

SUMMARY

Fisher, A.H. *Army "New Standards" personnel: Effect of remedial literacy training on performance in military service.* AFHRL-TR-71-13. Alexandria, Virginia: Manpower Development Division, Air Force Human Resources Laboratory, April 1971.

Problem

In 1966 the Department of Defense lowered entrance standards for military service. Many of the "New Standards" men who then entered the service were placed in remedial training programs, designed to upgrade their literacy status to a fifth-grade level or higher. This research sought to determine military performance. Another objective was to develop an equation for prediction of literacy scores at the end of literacy training.

Approach

Approximately 9,000 records were extracted from the Army Project 100,000 data file. Those whose literacy score reached the fifth-grade level were labeled "successful." Statistical analyses were done to determine whether successful and unsuccessful literacy trainees differed significantly in a variety of indices of military status and performance. A multiple regression equation was also developed to predict the post training literacy scores on the basis of items of information obtained at the time of entry into the service.

Results

Men who were successful and unsuccessful, respectively, in literacy training did not differ greatly in most performance indices. A multiple regression equation for predicting success in the literacy training course, using a randomly selected half of the group, yielded a multiple correlation of +.52; cross-validation with the remaining half of the group produced a correlation of +.50.

Conclusions

Men who were successful and unsuccessful in reaching the fifth-grade level of literacy in remedial training did not differ greatly on most indices of military status and performance. Successful trainees were slightly more likely to achieve a higher pay grade and to be judged eligible for reenlistment. It is possible to predict post remedial training literacy scores on the basis of information obtainable at the time of entering the service.

This summary was prepared by Jeanne B. Fites, Manpower Development Division, Air Force Human Resources Laboratory.

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Section I

INTRODUCTION

PROBLEM AND OBJECTIVES

In October 1966, the Department of Defense lowered mental and physical standards for accepting men into military service. Since that date, men who score as low as the 10th percentile on the Armed Forces Qualification Test (AFQT) are eligible for service, provided they achieve acceptable scores on supplementary aptitude tests. Also, men who previously would have been ineligible because of physical defects are now considered acceptable if the defects are correctable in nature (e.g., overweight). Personnel who entered the service as a result of the revised standards are referred to as "New Standards" men.

At the time of entering Army service, New Standards men are given a variety of tests, including the USAFI Achievement Tests III, Form A (Abbreviated Edition), composed of a reading test, a word knowledge test, and an arithmetic computation test. Men falling below specified minimum scores on this test are administered the USAFI Intermediate Tests, Form D, which includes, among others, reading, word knowledge, and arithmetic computation tests.

Many of the men accepted subsequent to the launching of this program, who score below the fifth grade-level in the reading section of the Intermediate Achievement Test, have been given remedial training, called Army Preparatory Training (APT). APT consists of basic education in reading, arithmetic, and social studies, supplemented with introductory military training. APT is designed to upgrade the reading capability of trainees to the fifth-grade level, or to whatever level is attainable, using a time period that does not exceed six weeks.[1]

It was considered desirable for the research staff to assess the overall effectiveness of the remedial training program in enabling New Standards men to be more effective soldiers. A system for identifying men who are most likely to profit from the remedial training was also sought.

Accordingly, the research herein reported had the following objectives:

(1) To determine whether men who successfully reach the fifth grade-level of reading ability in APT training are more successful in their Army careers than men who do not.

(2) To develop a prediction equation, based upon data obtained at the time of entry into the service, for predicting the terminal literacy score of men who receive APT.

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[1] U.S. Continental Army Command (CONARC) letter, ATIT-AT, 15 October 1970. Subject: Army Preparatory Training (APT) Program, p. 2.

APPROACH

The general plan called for extracting and analyzing appropriate information from the Project 100,000 Data File.[2] New Standards men, at the time of entry into the Army, are routinely administered a variety of tests, including a literacy test. All test scores, as well as numerous other items of biographic, demographic, and military status information, are entered into the computerized Project 100,000 data base.

For purposes of this study, the Project 100,000 file as of June 30, 1970 was examined. Records were extracted for men ($N = 8,999$) who had entered the Army between April 1968 and December 1969 and received remedial literacy training (Edit and Extract Procedures, Appendix I).

The next two sections of this report will describe, respectively, the procedure and the results obtained for each of the research objectives.

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[2]The data base, including format and coding convention, is described in Department of Defense Instruction 1145.3; Subject: *Military Personnel Data File and Reporting Procedures for "Project One Hundred Thousand,"* December 23, 1968. The File contained records for approximately 143,000 Army lower mental standard personnel in June 1970.

Section II

COMPARISON OF SUCCESSFUL AND UNSUCCESSFUL LITERACY TRAINEES ON VARIOUS INDICES OF MILITARY PERFORMANCE AND STATUS

CRITERION OF LITERACY SUCCESS

The final reading test score obtained by each man at the time of his terminating APT training was converted into a grade-level equivalent.[3] Since Army policy permits men to leave the program as soon as they can obtain a reading test score at or above the fifth grade-level, men who met this criterion within the six-week period will be referred to as "successful"; those who failed will he referred to as "unsuccessful." It should be noted that trainees who met the criterion required varying amounts of time to do so; some achieved it in as little as three weeks, some required the full six weeks.

The reading test used in determining terminal literacy was an equivalent form of the USAFI Intermediate Achievement Test. The split-half reliability coefficients of the various sections of this test, including the reading section, range from +.79 to +.97, with a median of +.91.[4]

INDICES OF MILITARY STATUS AND PERFORMANCE

The relationship between literacy success and each of the following indices was studied in this phase of the research:

- Pay Grade
- Military Occupation
  - (1) One-digit DoD code based on Primary Military Occupational Specialty (MOS)
  - (2) Two-digit DoD codes for the 15 most frequent Primary MOSs and an "all others" category
- Performance Evaluation
  - (1) Military behavior (conduct)
  - (2) Professional performance (proficiency)

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[3]Source: *Raw Score Conversion Table: USAFI Work Knowledge, USAFI Reading, and USAFI Arithmetic Computation Tests*, provided by the DoD U.S. Armed Forces Institute, Madison, Wis., March 1969.

[4]Based on students (non-adults) administered the Intermediate and Advanced Metropolitan Achievement Test batteries from which the USAFI tests were derived. See the review by Findley, W.C., in *The Fourth Mental Measurements Yearbook*, O.K. Buros (ed.). the Gryphon Press, Highland Park, N.J., 1953, pp. 47-52.

- Non-Judicial Punishment
- Court-Martial Convictions
- Reenlistment Eligibility
- Type of Discharge

PROCEDURE

As previously explained, records were extracted for a total of 8,999 New Standards men who had received APT training. There were then divided into four subgroups on the basis of time-in-service, since this factor obviously has a strong influence on rates of promotion, the scheduling of ratings, eligibility for discharge, and other items of performance. Table 1 indicates the number of men in each subgroup, and, for each subgroup, the terminal literacy scores in terms of grade-level equivalents.

The relationship between literacy success and each of the indices of military status and performance was studied by means of a contingency table analysis routine, BMD02S, which computes various nonparametric statistics as well as horizontal, vertical, and total percentages for the cross-tabulated cell entries.[5]

Table 1

Distribution of Terminal Literacy Scores in Grade-Level Equivalents

Grade-Level	Length of Service									
	Less Than 10 Months		10–14 Months		15–19 Months		More Than 19 Months		Total	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	1	<1	0	0.0	0	0.0	1	0.1	2	<1
2	6	0.2	6	0.3	10	0.4	3	0.2	25	0.3
3	84	3.3	92	4.1	105	4.5	49	2.6	330	3.7
4	142	5.7	127	5.6	211	9.0	101	5.4	581	6.5
5	734	29.3	665	29.6	671	28.5	437	23.2	2507	27.9
6	600	23.9	560	24.9	593	25.2	439	23.3	2192	24.4
7	369	14.7	302	13.4	305	12.9	263	14.0	1239	13.8
8	304	12.1	278	12.4	241	10.2	260	13.8	1083	12.0
9	165	6.6	129	5.7	151	6.4	173	9.2	618	6.9
10	53	2.1	42	1.9	38	1.6	76	4.0	209	2.3
11	47	1.0	45	2.0	27	1.1	76	4.0	195	2.2
12	4	0.2	3	0.1	5	0.2	6	0.3	18	0.2
	2509	100.0	2249	100.0	2357	100.0	1884	100.0	8999	100.2

[5] *BMD Biomedical Computer Programs.* W.J. Dixon (ed.), University of California Press, Berkeley, 1970, pp. 341-356. The statistics include Chi square, contingency coefficient, and maximum likelihood estimates.

RESULTS

Pay Grade

The relationship between literacy success (reading at the fifth grade-level or higher) and pay grade attained is presented in Table 2.

There was a statistically significant relationship ($p<.001$) between pay grade and literacy success in the longer length of service groupings of these personnel. Men who were successful in achieving literacy were more likely to have attained higher pay grades. Absence of a relationship between pay grade and literacy success for men at the lower grades can probably be attributed to the almost automatic promotion of servicemen at the lower grades.

Military Occupation

The primary military occupational skills of personnel were analyzed to determine their relationship to literacy success. For the nine major DoD categories, results appear in Table 3.

There was a significant relationship between literacy success and military occupation in certain of the longer length of service groupings of these personnel. Those who were successful in achieving literacy were less likely to have supply and service MOSs.

The large number of "Unknowns" in the "Less Than 10 Months" group is probably due to the fact that many of these men had not been in the service long enough to be assigned an MOS, or perhaps because of delays in the recording of the DOD occupational categories. The somewhat large number of "Unknowns" in the "More Than 19 Months" category cannot be explained on the basis of the information available.

Data were also analyzed for the 15 most frequent primary military occupational skills assigned to Army New Standards personnel.[6] The results of this analysis are shown in Table 4.

There was also a significant ($p<.001$, for the three groups with more than 10 months of service) relationship between literacy success and the distribution of the 15 most frequently assigned MOSs. Men who were successful in achieving literacy status were more likely to hold specialties such as infantry or automotive repair, and less likely to be in food service, supply, or materials receiving.

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[6] *Project One Hundred Thousand: Characteristics and Performance of "New Standards" Men*, Office of Secretary of Defense, Assistant Secretary of Defense (Manpower and Reserve Affairs), December, 1969, p. 34.

Table 2

Relationship Between Literacy Success and Pay Grade

Pay Grade	Length of Service							
	N = 2509 Less Than 10 Months		*N* = 2249 10--14 Months		*N* = 2357 15—19 Months		*N* = 1884 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful	Successful
	(233) (%)	(2276) (%)	(225) (%)	(2024) (%)	(326) (%)	(2031) (%)	(154) (%)	(1730) (%)
E-1	39.1	36.3	5.8	5.9	6.7	6.0	9.7	5.7
E-2	21.5	21.3	20.4	15.9	15.0	9.6	7.8	5.1
E-3	13.7	13.8	44.4	36.0	23.3	18.5	10.4	13.2
E-4	6.4	6.0	40.7	36.0	48.5	57.9	66.2	60.2
E-5 and Above	—	—	—	0.7	4.6	5.9	5.8	14.7
Unknown	19.3	22.6	2.7	5.5	1.8	2.1	—	1.1
	100.0	100.0	100.0	100.0	99.9	100.0	99.9	100.0

Table 3

Relationship Between Literacy Success and Assignment to Major DoD Occupations

DoD Occupational Category	Length of Service							
	N = 2509 Less Than 10 Months		*N* = 2249 10–14 Months		*N* = 2357 15–19 Months		*N* = 1884 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful	Successful
	(233) (%)	(2276) (%)	(225) (%)	(2024) (%)	(326) (%)	(2031) (%)	(154) (%)	(1730) (%)
Infantry	14.2	15.6	20.8	30.1	17.5	29.1	10.4	20.6
Elec. Equip. Repair	1.3	0.9	1.3	1.9	0.9	1.7	1.9	2.8
Comm. & Intelligence	2.1	1.7	0.9	3.5	0.9	3.9	0.6	2.9
Medical/Dental	0.9	1.0	0.4	1.4	1.2	2.2	–	1.4
Other Technical	–	0.1	0.9	0.3	–	0.7	0.6	0.6
Admin. Spec.	0.4	3.7	4.0	7.4	5.5	7.9	3.9	6.4
Elec./Mech. Equipment	9.9	8.7	17.8	17.5	17.8	19.9	23.4	22.8
Craftsman	2.1	2.7	12.9	8.0	16.3	8.4	11.0	7.5
Service & Supply	16.7	11.5	32.4	21.9	34.4	19.8	27.9	21.3
Unknown	52.4	54.1	8.5	8.1	5.6	6.3	20.1	13.7
	100.0	100.0	99.9	100.1	100.1	99.9	99.8	100.0

Table 4

Relationship Between Literacy Success and Assignment to the Most Frequent MOSs of New Standards Personnel

DoD Occupational Category	Length of Service							
	N = 2509 Less Than 10 Months		*N* = 2249 10–14 Months		*N* = 2357 15–19 Months		*N* = 1884 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful	Successful
	(233) (%)	(2276) (%)	(225) (%)	(2024) (%)	(326) (%)	(2031) (%)	(154) (%)	(1730) (%)
Infantry	8.2	9.4	14.2	18.9	11.7	18.1	4.5	12.5
Food Service	6.4	6.4	16.4	10.5	12.9	9.9	13.0	8.7
Artillery, Gunnery	2.6	2.3	0.9	4.1	1.2	4.0	0.6	1.8
Supply/Logistics	0.4	1.8	4.0	5.1	4.9	6.0	1.3	5.0
Wire Communications	6.0	4.3	6.7	6.9	3.7	6.8	4.5	8.8
Auto Repair	1.7	2.8	1.3	3.6	1.8	4.1	1.9	6.8
Motor Transport	6.0	3.2	2.2	4.9	3.4	2.7	3.9	5.5
Combat Engineering	3.4	3.4	5.3	6.1	4.6	6.4	4.5	4.5
Combat Operations Control	0.4	0.7	0.4	1.4	0.6	1.2	–	0.8
Armament Repair	1.7	0.7	5.8	4.0	8.3	5.3	11.0	2.3
Aircraft Repair	–	0.7	0.4	1.4	0.9	2.6	0.8	2.1
Mat. Rec., Stor., & Issue	1.7	0.5	5.8	2.2	11.3	3.8	7.1	3.6
Radio & Radar Code	1.7	1.0	–	1.8	0.3	2.1	0.6	2.0
Armor & Amphibian	–	0.4	0.4	1.0	–	0.7	0.6	1.7
Administration (Clerical)	–	1.4	–	1.5	0.6	1.3	1.3	0.8
Others and Unknowns	59.7	60.9	36.2	26.5	33.7	25.0	44.4	33.5
	99.9	99.9	100.0	99.9	99.9	100.0	99.8	100.0

Performance Evaluation

Since ratings in conduct and proficiency were generally not available for men with less than 15 months' service, results are presented for only the two more experienced length of service subgroupings. It should be noted that these ratings have little variability; they are highly concentrated in the "Excellent" category. The results of the analysis of the relationship between literacy success and conduct (military behavior) ratings appear in Table 5.

Table 5

Relationship Between Literacy Success and Military Behavior Ratings

Rating Category	Length of Service			
	N = 1599 15–19 Months		*N* = 1465 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful
	(207) (%)	(1392) (%)	(113) (%)	(1332) (%)
Excellent	96.1	95.4	90.3	94.3
Good	1.9	2.7	8.8	3.3
Fair	0.5	0.9	0.9	0.8
Unsatisfactory	1.5	0.9	–	1.6
	100.0	99.9	100.0	100.0

Note: Base excludes unknowns.

Based on the information shown in Table 5, there was no significant relationship between conduct ratings and literacy success. Men who did not achieve literacy success were just as likely to have received high conduct ratings as men who did.

An analysis was also made of the relationship between literacy success and proficiency, as measured by the professional performance rating. Results are given in Table 6.

There was no significant relationship between proficiency ratings and literacy success. Men who achieved literacy success were no more likely to have received higher proficiency ratings than those who did not.

Non-Judicial Punishments

For non-judicial punishments—those that are imposed for minor offenses such as traffic violations, unauthorized absences, lateness, and violation of curfew—the punishment *per se* typically consists of loss of privileges or extra duty. The relationship between number of non-judicial punishments and literacy success is given in Table 7.

There was no significant relationship between literacy success and the number of non-judicial punishments received.

Table 6

Relationship Between Literacy Success and Professional Performance Ratings

Rating Category	Length of Service			
	N = 1602 15–19 Months		*N* = 1447 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful
	(207) (%)	(1395) (%)	(113) (%)	(1334) (%)
Excellent	95.7	95.1	91.2	94.4
Good	2.3	3.1	7.9	3.3
Fair	1.0	0.9	0.9	0.8
Unsatisfactory	1.0	0.9	–	1.4
	100.0	100.0	100.0	99.9

Note: Base excludes unknowns.

Table 7

Relationship Between Literacy Success and Number of Non-Judicial Punishments

Number of Non-Judicial Punishments	Length of Service			
	N = 1609 15–19 Months		*N* = 1452 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful
	(206) (%)	(1403) (%)	(113) (%)	(1339) (%)
None	82.5	83.0	81.4	83.5
One	13.1	13.1	13.3	11.8
Two	2.9	2.4	3.5	2.9
Three or More	1.5	1.5	1.8	1.8
	100.0	100.0	100.0	100.0

Note: Base excludes unknowns.

Court-Martial Convictions

These convictions are given for serious offenses, for example, robbery, striking a superior, desertion. Punishments include confinement in a stockade or disciplinary barracks. The information on the number of court-martial convictions in relation to literacy success appears in Table 8.

There was no significant relationship between literacy success and the number of court-martial convictions.

Table 8

Relationship Between Literacy Success and Number of Court-Martial Convictions

Number of Court-Martial Convictions	Length of Service			
	N = 1609 15–19 Months		*N* = 1452 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful
	(205) (%)	(1404) (%)	(113) (%)	(1339) (%)
None	99.0	98.1	97.3	97.0
One	1.0	1.6	2.7	2.7
Two	–	0.2	–	0.1
Three or More	–	–	–	0.1
	100.0	100.0	100.0	99.9

Note: Base excludes unknowns.

Reenlistment Eligibility

A man is ordinarily considered eligible for reenlistment if he meets specified minimum scores on certain aptitude tests. However, his commanding officer has the authority to pronounce him *ineligible*, in spite of test scores, if he sees fit to do so.

Approximately 60% of the men with 15 or more months' service had been categorized as to reenlistment eligibility (i.e., desirability) by their superiors. An analysis was made of the relationship between reenlistment eligibility and literacy success. The results are given in Table 9.

Table 9

Relationship Between Literacy Success and Reenlistment Eligibility

Reenlistment Eligibility	Length of Service			
	N = 590 15–18 Months		*N* = 1101 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful
	(76) (%)	(514) (%)	(96) (%)	(1005) (%)
Eligible	43.4	56.4	53.1	58.8
Not Eligible	56.6	43.6	46.9	41.2
	100.0	100.0	100.0	100.0

Note: Base is the number of men rated for reenlistment eligibility.

There was a consistent relationship between literacy success and reenlistment eligibility. Men who were successful in meeting the literacy criterion were more likely to be rated "eligible" for reenlistment. The relationship achieved statistical significance ($p<.05$) for the 15- to 19-month subgroup, but did not for those with more than 19 months' service.

Type of Discharge

Approximately 40% of the men with more than 15 months of service had been discharged as of the reporting date of the data file. The results of an analysis of the relationship between the type of discharge and literacy success appear in Table 10.

There was no consistent relationship between literacy success and type of discharge received. Men whose discharge was "Honorable" were slightly more likely to have achieved literacy success. This relationship achieved statistical significance only in the subgroup of men having more than 19 months of service.

Table 10

Relationship Between Literacy Success and Type of Discharge

Type of Discharge	Length of Service			
	N = 603 15–19 Months		*N* = 1143 More Than 19 Months	
	Unsuccessful	Successful	Unsuccessful	Successful
	(77) (%)	(526) (%)	(104) (%)	(1039) (%)
Honorable	90.9	92.6	94.2	98.3
General	5.2	3.0	1.0	0.6
Undesirable	3.9	4.2	4.8	1.1
Bad Conduct	–	0.2	–	*
Dishonorable	–	–	–	–
	100.0	100.0	100.0	100.0

Note: Base includes only discherged men.

*Less than 0.1%.

Section III

DEVELOPMENT OF AN EQUATION FOR PREDICTING LITERACY ACHIEVEMENT IN APT TRAINING

This section describes the development of a regression equation for predicting the terminal literacy score, in terms of grade-level equivalent, of New Standards men who receive APT training.

From the total sample of 8,999 men, the records of 269 were eliminated because of incomplete data. The rest were randomly divided into two subsets: (a) an analysis sample (N = 4,375), and (b) a cross-validation sample (N = 4,355). The analysis sample was used to develop the original equation.

PREDICTOR VARIABLES

The predictor variables consisted of test scores (at time of entering the service) and certain demographic characteristics. Scores on the following tests were included:

(1) The USAFI Intermediate Achievement Tests for Reading.
(2) The USAFI Intermediate Achievement Tests for Word Knowledge.
(3) The USAFI Intermediate Achievement Tests for Arithmetic Computation.
(4) The Armed Forces Qualification Test (AFQT), a 60-minute speeded estimate of mental ability. This test is used to identify New Standards personnel in conjunction with education and AQB scores. Four subtest scores are combined to yield a single composite score (percentile).[7]
(5) Test AQB-GT—The Army Qualification Battery[8] measure of general technical aptitude.
(6) Test AQB-GM—The AQB measure of general maintenance aptitude.
(7) Test AQB-MM—The AQB measure of motor maintenance aptitude.
(8) Test AQB-EL—The AQB measure of electronics aptitude.
(9) Test AQB-IN—The AQB measure of infantry aptitude.
(10) Test AQB-CL—The AQB measure of clerical aptitude.
(11) Test AQB-AE—The AQB measure of armor, artillery, and engineering aptitude.

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[7] The four AFQT subtest areas are: (a) verbal, (b) arithmetic, (c) pattern analysis, and (d) shop mechanics. Some aptitude area test scores are derived from weighted combinations of the AFQT subtests. Other aptitude area scores derived from the administration of additional tests.

[8] Bayroff, A.G., Seeley, L.C., and Anderson, A.A. *Development of the Army Qualification Battery, AQB-1*, Department of the Army, Office of the Adjutant General, Technical Research Report 1117, October 1959.

In addition to these test scores, the following characteristics were included as predictor variables in the original equation:

Age at entry into the service
Race
Number of civil court convictions
Educational level at entry
Civilian employment status
Enlistee/inductee status

Edit and reformat procedures were employed to transform the data for statistical analysis (Appendix I). All predictor variables were correlated with the criterion and with each other. The correlation coefficients are presented in Appendix II.

DEVELOPING THE ORIGINAL EQUATION

The primary objective of this phase of the research was the development of an equation to provide the best possible prediction of terminal literacy scores. For this reason, all 17 predictor variables were included in the multiple regression analysis. A modified version of a BMD forward selection multiple regression program, BMD03R,[9] was used. The regression weights for the equation are presented in Table 11.

A multiple R of +.52 was obtained using the 17 predictor variables. Appendix III contains details of the multiple regression analysis.[10] The predictor variables that had the highest partial correlations with the criterion were: (a) Initial Reading score, (b) Initial Word Knowledge score, and (c) AQB-GM.

CROSS-VALIDATION

Data from the cross-validation sample were used to evaluate the regression equation. Predicted literacy status (in terms of grade level) were computed for each of 4,355 trainees. Predicted scores were correlated with actual termination (training completion) scores. A correlation coefficient of +.50 was found. The difference between this correlation coefficient and the multiple R is attributable to shrinkage occurring because of chance factors operative in the process.

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[9] *BMD Biomedical Computer Programs*, W. I. Dixon (ed.), University of California Press, Berkeley, 1970, pp. 258-269.

[10] It should be mentioned that the magnitude of regression weights, such as those given in Table 11, is not directly indicative of their importance in actually predicting the criterion. Partial correlation coefficients, presented in Appendix III, are more useful for gaining an insight into the relative strength of predictors.

Table 11

Regression Weights for the Prediction of Training Completion Scores

Predictor Variables	Regression Weights
Age at Entry	− 0.03191
Race	0.17933
Civil Court Convictions	0.01043
AQB-GT	− 0.00099
AQB-GM	− 0.02438
AQB-MM	0.00332
AQB-EL	0.01154
AQB-IN	0.00107
AQB-CL	− 0.00143
AQB-AE	0.01046
AFQT Percentile	0.05709
Initial Word Knowledge	0.48011
Initial Reading Score	0.07756
Initial Arithmetic Comprehension	0.07098
Education Level	− 0.03423
Employment as Civilian	− 0.02451
Enlistee/Inductee Status	− 0.06308
Intercept Value	3.61956

Section IV

SUMMARY AND CONCLUSIONS

PROBLEM

In 1966 the Department of Defense lowered somewhat its standards for accepting men into military service. Many of the "New Standards" men were relatively low in literacy skills. Accordingly, the Army established a remedial literacy training program for men whose initial reading skill was below the fifth grade-level. The study reported here was performed to determine the effects that such remedial training has upon military performance.

OBJECTIVES

(1) To determine whether men who successfully reach the fifth grade-level of reading ability in remedial training are more successful in their Army careers than men who do not.

(2) To develop an equation for predicting terminal reading scores of men who undergo remedial literacy training.

APPROACH

The general research plan called for extracting and analyzing appropriate information from a computerized data base known as the Project 100,000 Data File. This file contains, for all New Standards men, their scores on a variety of tests and also various items of biographic and demographic information.

PROCEDURE

Approximately 9,000 records were extracted from the data file, from men who had received remedial literacy training. Those whose terminal reading score reached the fifth grade-level were labeled "successful." Statistical analyses were done to determine whether successful and unsuccessful literacy trainees differed significantly in a variety of indices of military status and performance.

The other phase of this research sought to develop the best possible equation for predicting the terminal reading score of remedial literacy trainees on the basis of 17 items of information obtained at the time of entry into the service. A multiple regression equation was developed in one sample of men and cross-validated in another.

RESULTS

(1) Approximately 90% of the literacy trainees reached the fifth grade-level (or higher) of reading skill. For purposes of this report, these men are referred to as "successful" trainees.

(2) Among men who had been in service 15 months or longer, the "successful" trainees were:

(a) More likely to have achieved higher pay grades.
(b) More likely to have been judged eligible for reenlistment.
(c) Less likely to have been assigned to supply and service MOSs.

(3) Successful and unsuccessful trainees did not differ significantly on the following indices:

(a) Military behavior ratings.
(b) Military performance ratings.
(c) Number of non-judicial punishments.
(d) Number of court-martial convictions.
(e) Type of discharge.

(4) A multiple correlation coefficient of +.52 was obtained between 17 predictor variables and terminal reading ability score. The prediction equation is presented in the report. The main predictors were: (a) Initial Reading score, (b) Initial Word Knowledge score, and (c) AQB-GM.

(5) Cross-validation produced R = +.50.

CONCLUSIONS

(1) Men who were successful and unsuccessful, respectively, in reaching the fifth grade-level of literacy in remedial training did not differ greatly on most indices of military status and performance. Successful trainees were slightly more likely to achieve a higher pay grade and to be judged eligible for reenlistment.

(2) It is possible to predict terminal literacy score in remedial training on the basis of information obtainable at the time of entering the service.

Appendix I

EDIT AND EXTRACT PROCEDURES

PACE Literacy Study Transgenerator
Program Description

Purpose: Designed to edit and transgenerate both alpha and numeric input data extracted from Project 100,000 Army files to numeric grouped codes for use with the BIOMED programs.

Program Designation: PACE-6

Programmer: Gary J. Hartzler

References: a) Department of Defense Instruction Number 1145-3 dated December 23, 1968. Subject: Military Personnel Data File and Reporting Procedures for "Project One Hundred Thousand"

Detailed Description: PACE-6 reads an extract from the Army "Project One Hundred Thousand" file described in reference (a) and produces, record for record, an edited file containing both input record data and additional numeric codes generated for later use. Rules employed to extract the records are included. Rules used to generate desired numeric codes and the location of the codes on the output record are also listed. The new variables were coded to either dichotomize or ordinalize the data.

Input/Output Specifications: The input file is 270 BCD characters blocked 20 records/block with standard labels. The output file is 350 BCD characters blocked 20 records/block with standard labels.

Rules for Record Extraction: This literacy study population was extracted from the June, 1970, Army Project "One Hundred Thousand" File. The records of all New Mental Standards men (not including Medically Remedial accessions) with valid initial reading test scores were checked for the presence of (a) valid Terminal Reading Test scores, and (b) valid 23-month Reading Test scores. Extract rules appear below.

Input	Global Tests	9000 Test	3000 Test
June 30, 1970 U.S. Army Project 100,000 File	Must be a New Mental Standards man (not Medically Remedial) and have a valid initial Reading Test score	Must have a valid Terminal Reading Test score, but not a 23-month score	Must have a valid 23-month Reading Test score, but not a Terminal Reading Test score

All those men with (a) and not (b) are the men who received training. These cases comprise the N=9000 sample.

The following variables were generated for each record. Variables unique to the two populations are designated.

Output Variable	Tape Position	Coding Rules
Age	42-43	Date of Entry - Date of Birth, unless either is blank, then use Age at entry if it is valid. 25 = invalid
Race	53	1 = white 2 = Other
Ethnic Group	54	1 = Spanish American 2 = American Indian 3 = Oriental American 4 = Puerto Rican 5 = Filipino 6 = Hawaiian 7 = Eskimo 8 = Aleutian 9 = Unknown 0 = Not Applicable
School Grades Failed Or Repeated	57	0-8 Number; 9 = Unknown
Civil Court Convictions	58	0-8 Number; 9 = Unknown
AQB Test Scores (7 Tests)	59-79	0=199 Test Score; 999 = Unknown
AFQT	80-81	1-98 AFQT Score; 99 = Unknown
Pay Grade	165	1-8 Latest Pay Grade; 9 = Unknown
Primary MOS (1 digit DoD designation)	181	0-9
Performance Evaluation A and B	195,197	1 = Excellent, 2 = Good, 3 = Fair 4 = Unsatisfactory, 5 = Unknown
Non-judicial Punishments	204	0-8 Number; 9 = Unknown
Court-Martials	205	0-8 Number; 9 = Unknown
Discharge Type	247	1 = Honorable, 2 = General, 3 = Undesirable, 4 = Bad Conduct, 5 = Dishonorable, 6 = Not Applicable, 7 = Unknown

Output Variable	Tape Position	Coding Rules
Reenlistment Eligibility	248	0 = Not Applicable, 1 = Not Eligible, 2 = Eligible, 9 = Unknown
Grade Equivalent Score on Initial Word Knowledge Test	254-256	.1-12.9 Equivalent grade level of Score Achieved; 0 = Unknown
Grade Equivalent Score on Initial Reading Test	257-259	.1-12.9; Note: Extract rules preclude unknown values.
Grade Equivalent Score on Initial Arithmetic Test	260-262	.1-12.9 0 = Unknown
Grade Equivalent Score on 23-month Reading Test	266-268	0-12.9; Note: N = 3000 extract rules preclude unknown values.
Grade Equivalent Score on termination of Remedial Training Reading Test	266-268	0-12.9; Note: N = 9000 extract rules preclude unknown values.
Difference Between Initial and Follow-up Reading Test Score	276-279	−12.0 to +12.0
Final Reading Score of Fifth Grade or Higher	284	1 = Yes; 0 = No; Note: Computed from follow-up reading score.
Geographic Region (Census)	285	0-9 by State of Record
Highest year of education completed (Grouped)	287	1 = Non-High School Graduate, 2 = HS Graduate, 3 = Some College, 4 = College Graduate, 5 = Unknown
Recruiting Region	288	1, 3, 4, 5, 6, by State of Record
Geographic Region	289	0-4 Macro of Census Regions
15 Most Prevalent Primary MOS in Army	313-314	1 = Infantry, 2 = Food Service, 3 = Artillery, 4 = Supply and Logistics, 5 = Wire Communications, 6 = Automotive Repair, 7 = Motor Transport, 8 = Combat Engineering, 9 = Combat Operations Control, 10 = Armament Repair, 11 = Aircraft Repair, 12 = Material Storage and Issue, 13 = Radio and Radio Code, 14 = Armor, 15 = Administration (Clerical), 16 = Other
Enlistee/Inductee	318	0 = Inductee, 1 = Enlistee, 9 = Other
Separated	319	1 = Yes, 0 = No

Output Variable	Tape Position	Coding Ruling
Employed at Entry to Service	315	1 = Yes (weekly salary greater than 0); 0 = No
Length of Service in months	316-317	If date of Separation exists, Value = Date of Separation minus Date of Entry: else use As-of-Date Minus Date of Entry. 99 = Unknown
Record Valid for Regression Validity Test Indicator	290	1 = Yes, 0 = An invalid code exists among the following: HYEC, CCC, GFR, AQB, AFQT, AGE, and Grade Equivalent Test Scores.

Appendix II

INTERCORRELATIONS

List of Variables

Variable Number	Variable
1	Age at Entry
2	Race
3	Number of Civil Court Convictions
4	AQB-GT
5	AQB-GM
6	AQB-MM
7	AQB-EL
8	AQB-IN
9	AQB-CL
10	AQB-AE
11	AFQT Percentile
12	Initial USAFI Word Knowledge Score
13	Initial USAFI Reading Score
14	Initial USAFI Arithmetic Comp. Score
17	Educational Level at Entry
18	Employed as Civilian
19	Enlistee/Inductee
15	Training Completion Score (Criterion)

PACE REGRESSION RUN 9M POPULATION 2-24-71

SELECTION NO. 1- 1

CORRELATION COEFFICIENTS

NOTE: A CORRELATION OF -9.99999 INDICATES THAT ONE OR BOTH VARIABLES HAS A VARIANCE OF ZERO.

VARIABLE NO. 1	1.00000	0.10163	0.07171	-0.00512	0.02277	0.02039	0.01282	-0.01642	-0.03409	0.01924
	-0.05110	0.00456	-0.00439	-0.03871	0.11686	0.14342	-0.28279	-0.03086		
VARIABLE NO. 2	0.10163	1.00000	-0.02528	0.00274	-0.14014	-0.05493	-0.07583	0.00806	-0.02940	-0.03832
	-0.18267	0.04216	0.03105	-0.04711	0.19349	0.00599	-0.06875	0.05834		
VARIABLE NO. 3	0.07171	-0.02528	1.00000	-0.00365	0.02064	0.01904	0.01295	-0.00788	-0.00147	0.01756
	0.02173	0.00440	0.01949	-0.03612	-0.08306	0.01762	-0.08362	0.00427		
VARIABLE NO. 4	-0.00512	0.00274	-0.00365	1.00000	0.48010	0.62864	0.63419	0.76812	0.83323	0.66502
	0.19877	0.21209	0.12950	0.12194	0.00340	-0.00090	0.03207	0.15308		
VARIABLE NO. 5	0.02277	-0.14014	0.02064	0.48010	1.00000	0.51677	0.54702	0.52620	0.51310	0.49644
	0.37802	-0.23047	-0.10422	-0.07125	-0.17287	0.01700	0.03463	-0.15777		
VARIABLE NO. 6	0.02039	-0.05493	0.01904	0.62864	0.51677	1.00000	0.79111	0.58487	0.57750	0.88505
	0.06946	0.21544	0.14335	0.00756	-0.17113	0.02655	-0.00603	0.19225		
VARIABLE NO. 7	0.01282	-0.07583	0.01295	0.63419	0.54702	0.79111	1.00000	0.59268	0.60929	0.73124
	0.09615	0.16460	0.12997	0.01366	-0.15776	0.01012	0.01721	0.16950		
VARIABLE NO. 8	-0.01642	0.00806	-0.00788	0.76812	0.52620	0.58487	0.59268	1.00000	0.68129	0.61593
	0.10952	0.08687	0.09193	0.11430	-0.04035	-0.01082	0.04409	0.08334		
VARIABLE NO. 9	-0.03409	-0.02940	-0.00147	0.83323	0.51310	0.57750	0.60929	0.68129	1.00000	0.61474
	0.17115	0.20316	0.12667	0.14037	0.02557	-0.02430	0.06670	0.12521		
VARIABLE NO.10	0.01924	-0.03832	0.01756	0.66502	0.49644	0.88505	0.73124	0.61593	0.61474	1.00000
	0.05024	0.25066	0.15642	0.02264	-0.13660	0.02145	0.00733	0.20935		
VARIABLE NO.11	-0.05110	-0.18267	0.02173	0.19877	0.37802	0.06946	0.09615	0.10952	0.17115	0.05024
	1.00000	-0.03935	-0.02591	0.07583	-0.22308	-0.01656	0.18019	0.00935		
VARIABLE NO.12	0.00456	0.04216	0.00440	0.21209	-0.23047	0.21544	0.16460	0.08687	0.20316	0.25066
	-0.03935	1.00000	0.42537	0.14429	0.02692	0.02599	0.00668	0.46705		

VARIABLE NO.13

-0.00439	0.03105	0.01949	0.12950	-0.10422	0.14335	0.12997	0.09193	0.12667	0.15642
-0.02591	0.42537	1.00000	0.15077	0.01230	0.03081	0.01078	0.24805		

VARIABLE NO.14

-0.03871	-0.04711	-0.03612	0.12194	-0.07125	0.00756	0.01366	0.11430	0.14037	0.02264
0.07583	0.14429	0.15077	1.00000	0.14612	-0.03996	-0.03720	0.11759		

VARIABLE NO.17

0.11686	0.19349	-0.08306	0.00340	-0.17287	-0.17113	-0.15776	-0.04035	0.02557	-0.13660
-0.22308	0.02692	0.01230	0.14612	1.00000	-0.01884	-0.14689	-0.01176		

VARIABLE NO.18

0.14342	0.00599	0.01762	-0.00090	0.01700	0.02655	0.01012	-0.01082	-0.02430	0.02145
-0.01656	0.02599	0.03081	-0.03996	-0.01884	1.00000	-0.18405	0.00028		

VARIABLE NO.19

-0.28279	-0.06875	-0.08362	0.03207	0.03463	-0.00603	0.01721	0.04409	0.06670	0.00733
0.18019	0.00668	0.01078	-0.03720	-0.14689	-0.18405	1.00000	0.00515		

VARIABLE NO.15

-0.03086	0.05834	0.00427	0.15308	-0.15777	0.19225	0.16950	0.08334	0.12521	0.20935
0.00935	0.46705	0.24805	0.11759	-0.01176	0.00028	0.00515	1.00000		

Appendix III

MULTIPLE REGRESSION INFORMATION

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PACE REGRESSION RUN 9M POPULATION 2-24-71

SELECTION NO. 1- 1

SAMPLE SIZE 4375
NO. OF VARIABLES 18 NO. OF VARIABLES DELETED 1 (FOR VARIABLES DELETED, SEE BELOW)
DEPENDENT VARIABLE IS NOW NO. 15

COEFFICIENT OF DETERMINATION 0.2666
MULTIPLE CORR. COEFFICIENT 0.5163

SUM OF SQUARES ATTRIBUTABLE TO REGRESSION 3520.95508
SUM OF SQUARES OF DEVIATION FROM REGRESSION 9685.13281

VARIANCE OF ESTIMATE 2.22289
STD. ERROR OF ESTIMATE 1.49094

INTERCEPT (A VALUE) 3.61956

ANALYSIS OF VARIANCE FOR THE MULTIPLE LINEAR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	17	3520.95508	207.11499	93.1737
DEVIATION ABOUT REGRESSION...	4357	9685.13281	2.22289	
TOTAL...	4374	13206.09020		

VARIABLE NAME	MEAN	STD. DEVIATION	REG. COEFF.	STD.ERROR OF REG.COE.	COMPUTED T VALUE	PARTIAL CORR. COE.	SUM OF SQ. ADDED	PROP. VAR. COM.
Age at Entry.....	19.77005	1.77885	-0.03191	0.01349	-2.37178	-0.03591	12.57486	0.00095
Race.....	1.34880	0.47665	0.17933	0.04965	3.62661	0.05486	58.42427	0.00382
Civil Court Convictions ..	0.11520	0.54641	0.01643	0.04172	0.25005	0.00379	0.96228	0.00007
AQB-GT.....	67.47108	16.65666	-0.00099	0.00299	-0.32937	-0.00499	308.12075	0.02333
AQB-GM.....	91.13120	17.91436	-0.02438	0.00202	-12.09245	-0.18020	868.77329	0.06579
AQB-MM.....	84.86240	20.09102	0.00332	0.00273	1.21701	0.01844	630.63793	0.04775
AQB-EL.....	81.59724	19.64387	0.01154	0.00204	5.66342	0.08549	101.23969	0.00767
AQB-IN.....	76.14354	17.91767	0.00107	0.00214	0.50391	0.00763	2.79288	0.00021
AQB-CL.....	77.48318	17.49257	-0.00143	0.00249	-0.57351	-0.00869	18.24173	0.00138
AQB-AE.....	79.39381	19.67411	0.01046	0.00264	3.96187	0.05991	89.60553	0.00679
AFQT Percentile.....	14.34560	3.21240	0.05709	0.00840	6.79928	0.10247	238.44270	0.01806
Initial Word Knowledge....	4.75378	1.21532	0.48011	0.02338	20.53742	0.29769	1162.05852	0.08799
Initial Reading Score.....	4.02539	0.80712	0.07756	0.03121	2.48518	0.03762	16.52301	0.00125
Initial Arith. Comp.	5.62681	0.90017	0.07098	0.02661	2.66768	0.04038	16.45083	0.00125
Educational Level	1.43909	0.52542	-0.03423	0.04759	-0.71938	-0.01090	0.80324	0.00006
Employed as Civilian.....	0.74743	0.43454	-0.02451	0.05325	-0.46026	-0.00697	0.17461	0.00001
Enlistee/Inductee.....	0.36811	0.46177	-0.06307	0.05311	-1.18749	-0.01799	3.13458	0.00024
Training Completion Score.	0.69415	1.73759						

COMP. CHECK ON FINAL COEFF. -0.06307

VARIABLES DELETED... 16

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13. ABSTRACT

In 1966 the Department of Defense lowered entrance standards for military service. Many of the "New Standards" men who then entered the service were placed in remedial training programs (Army Preparatory Training, APT), designed to upgrade their literacy status to a fifth-grade level or higher. This research sought to determine whether "success" in remedial literacy training was associated with superior military performance. Another objective was to develop an equation for predicting terminal literacy scores. Analysis for 9,000 Army personnel was carried out on data extracted from the computerized Project 100,000 data file. Men who were successful and unsuccessful, respectively, in literacy training did not differ greatly in most performance indices. Successful trainees were slightly more likely to achieve higher pay grades and to be judged eligible for reenlistment A multiple regression equation was developed for predicting success in the literacy training course. This analysis, using a randomly selected half of the group, yielded a multiple correlation of +.52; cross-validation with the remaining half of the group produced a correlation of +.50.

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